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(19) (CA) **CANADIAN PATENT** (12)

(54) Method and Apparatus for Plastic Impregnation and Jacketing of Wire Ropes

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Abstract of the Disclosure:

A method for single pass impregnation and jacketing of a wire rope comprises the steps of injecting plastic material in molten state into the wire rope under sufficient heat and pressure to fill the interstices between at least the outer
5 strands of the rope, and directing the excess plastic material from the surface of the filled wire rope at the exit of the extrusion process to provide a jacket of plastic material integrally formed with the filled wire rope. The apparatus comprises an extruder for injecting the plastic
10 material into the wire rope and a die located at the exit end of the extruder for removing the excess plastic material from the surface of the filled rope and subsequently redirecting it onto the surface of the wire rope to provide the jacket of plastic material.

METHOD AND APPARATUS FOR PLASTIC IMPREGNATION AND JACKETING
OF WIRE ROPES

This invention relates to a method and apparatus for single pass impregnation and jacketing of wire ropes.

It is well known to impregnate wire ropes with plastic material in order to decrease wear and fatigue of the rope and increase its life. Canadian Patent No. 1,208,863 issued to the same interest as the present application discloses such a plastic filled wire rope. It is often desirable in some applications where a plastic filled wire rope does not pass over shackles, pulleys or the like, such as in mine shaft balanced ropes, to provide a jacket of plastic material over the rope to prevent corrosion. This is normally done by subsequently extruding a jacket of plastic material over the plastic filled wire rope. This operation has however never been very satisfactory because the subsequently applied jacket of plastic material does not adequately adhere to the plastic filled wire rope and eventually peels off.

It is the object of the present invention to provide a jacket of plastic material which is integrally formed during impregnation of the plastic material and therefore forms part of the plastic filled wire rope.

The method, in accordance with the present invention comprises the steps of injecting plastic material in molten state into the wire rope under sufficient heat and pressure to fill the interstices between at least the outer strands of the rope, and directing the excess plastic material from the



surface of the filled wire rope at the exit of the extrusion process to form a jacket of plastic material integral with the plastic material of the filled wire rope.

5 The thickness of the jacket of plastic material is preferably between about 0.05 and 0.2 inch (1.25 and 5 mm) depending on the diameter of the wire rope and its desired properties.

10 The apparatus for single pass impregnation and jacketing of the wire rope comprises an extruder for injecting plastic material in molten state into the wire rope under sufficient heat and pressure to fill the interstices between at least the outer strands of the wire rope, and a die located at the exit end of the extruder for removing the excess plastic material from the surface of the wire rope and subsequently redirecting it onto the surface of the wire rope to provide a jacket of plastic material integral with the plastic material of the filled wire rope.

15 The jacketing die preferably comprises a scraper having an inner diameter slightly larger than the diameter of the wire rope for removing the excess plastic material and means for subsequently redirecting the excess plastic material onto the surface of the wire rope to form the jacket of plastic material.

20 The invention will now be disclosed, by way of example, with reference to the accompanying drawings in which:

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Figure 1 is a longitudinal, generally cross-sectional view of the extruder arrangement for carrying out the preferred embodiment in accordance with the present invention;

5 Figure 2 is an enlarged cross-sectional view along line 2-2 of the jacketing die shown in Figure 1; and

Figure 3 is a cross-sectional view of a plastic filled wire rope made with the method in accordance with the invention.

10 Referring to Figures 1 and 2, preheated wire rope 10 is passed through an extrusion cross-head 11. The preheating operation has not been illustrated because it can be carried out by any desired means, such as an induction heater, a flame heater or the like.

15 Molten plastic is typically supplied by an extruder through passages 12, 13 and 14, as shown by the arrows. The plastic is supplied under pressure which is generated by an extrusion screw (not shown). The pressurized plastic penetrates the rope 10 between extrusion dies 16 and 17 and
20 the rearward flow of plastic through the rope pushes out any excess lubricant 15 at the rear of die 16 and out of the cross-head 11. Bulging of the excess plastic material between the strands normally occurs as the filled rope exits die 17. A jacketing die 18 is mounted on the exit end of die
25 17 for removing such excess plastic material and redirecting it onto the plastic filled wire rope to form a jacket integral with the plastic material of the plastic filled wire

rope. The jacketing die comprises a scraper 19 having an inner diameter slightly larger than the diameter of the wire rope to remove the excess plastic material from the surface of the wire rope. The scraper is mounted in an inside cavity 5 20 formed in the jacketing die and is centrally spaced in the cavity by means of spacers 21 which define a passage between the cavity and the scraper to allow forward flow of plastic material onto the plastic filled wire rope. The scraper is provided with adjustment screws 22 to ensure that the jacket 10 of plastic material is of even thickness around the wire rope. It is to be understood that other means for removing excess material from the surface of the wire rope and redirecting so as to form a jacket integral with the plastic filled wire rope are also envisaged within the scope of this 15 invention.

Figure 3 shows a cross-section of a typical filled wire rope having 8 outer strands over 8 inner strands over a 6 strand IWRC (Independent Wire Rope Core). This wire rope 23 is essentially fully filled with plastic material 24 in the 20 interstices between the individual outer and inner strands and further comprises a jacket having a thickness between about 0.05 and 0.20 inch integrally formed with the plastic filled wire rope. With proper adjustment of the scraper 19, the jacket is made concentric with the wire rope which means 25 that an uniform layer of plastic material is formed on the wire rope for adequate protection of the wire rope against corrosion.

Although the invention has been disclosed with reference to a plastic filled lubricated wire rope of the type disclosed in Canadian Patent No. 1,208,863 referred to above, it is to be understood that it may also apply to
5 any plastic filled wire rope whether it is lubricated, galvanized or even dry. It is also to be understood that the expression "wire rope" may mean either the final wire rope product or a wire rope core around which further strands may be wound to produce the final product. It is
10 quite common in the industry to use a wire rope as a core in order to make a larger wire rope product. In this case the jacket around the wire rope core will act as a cushion for the surrounding strands and thereby will extend the life of the final wire rope product.

CLAIMS

1. A method for single pass impregnation and jacketing of a wire rope made of several outer strands wound over inner strands comprising the steps of:

- 5 a) injecting plastic material in molten state into the wire rope under sufficient heat and pressure to fill the interstices between at least the outer stands of the rope; and
- 10 b) removing the excess plastic material from the surface of the wire rope and subsequently redirecting said excess plastic material onto the surface of the wire rope so as to provide a jacket of plastic material integrally formed with the wire rope and concentric thereto.

15 2. A method as defined in claim 1 wherein the thickness of the jacket of plastic material is between about 0.05 and 0.2 inch (1.25 and 5 mm).

20 3. A method as defined in claim 1, wherein the wire rope is a lubricated, galvanized or essentially dry wire rope.

4. An apparatus for single pass impregnation and jacketing of a wire rope made of several outer strands wound over inner strands comprising:

- 25 a) an extruder for injecting plastic material

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in molten state into the wire rope under sufficient heat and pressure to fill the interstices between at least the outer strands of the wire rope; and

5 b) a die located at the exit end of the extruder for removing the excess plastic material from the surface of the wire rope and subsequently redirecting said excess plastic material onto the surface of the wire rope so as to provide a jacket of plastic material which is
10 integral with the plastic material of the wire rope and concentric thereto.

5. An apparatus as defined in claim 4, wherein the jacketing die comprises an inside cavity, a scraper having an inside diameter slightly larger than the outer diameter
15 of the wire rope mounted in said cavity for removing the excess plastic material from the surface of the wire rope, means for defining a passage between the scraper and the wall of the cavity do direct the excess plastic material
20 onto the surface of the wire rope to form an integral jacket of plastic material on the wire rope, and a adjustment means mounted on the jacketing die and engaging the scraper to ensure that the jacket of plastic material is concentric with the wire rope.



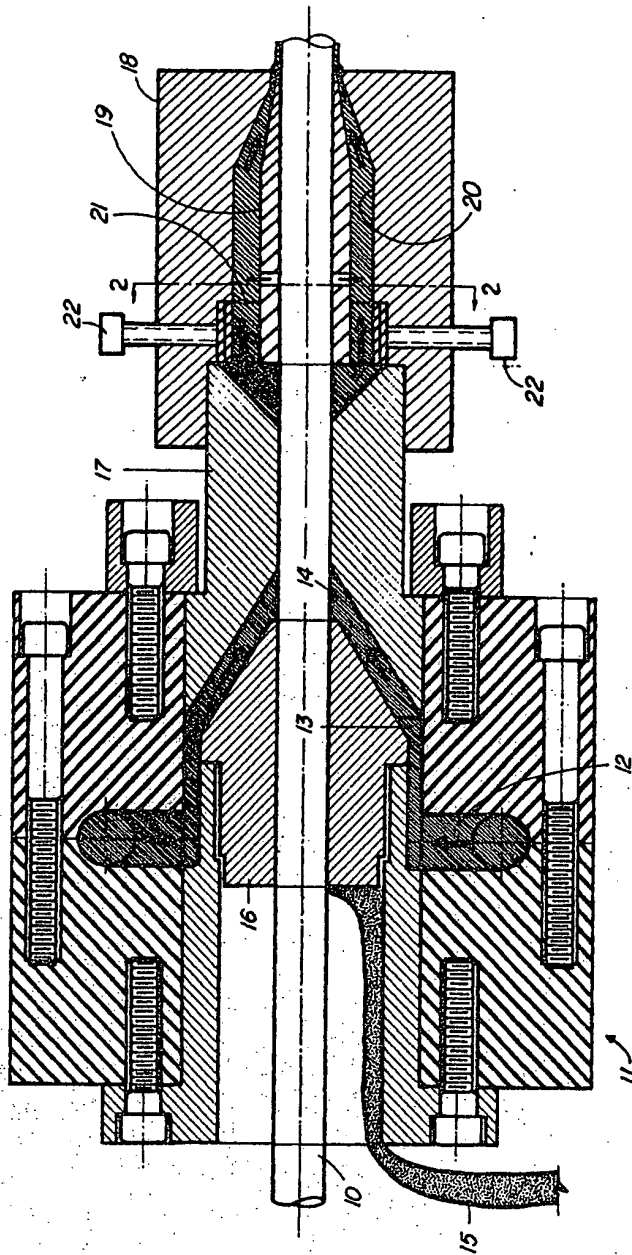
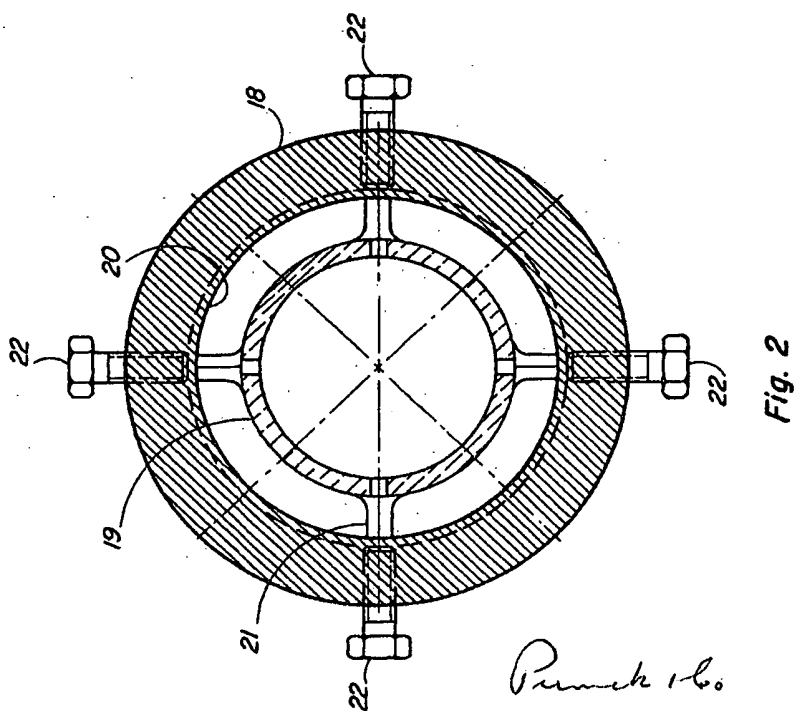


Fig. 1

Princk 160



Permitt. 16.

